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X FIBERS AND OTHER MATERIALS

USED IN INSULATING

ELECTRIC WIRE AND CABLE



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Preliminary Summary Report  
on volume of consumption X

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Washington, D. C.  
June 1954

This report deals with one of a series of studies of consumption of farm products, conducted by the Market Surveys Section of the Agricultural Marketing Service, under the direction of Trienah Meyers, Acting Head of the Section. The report was prepared by Jean M. Morgan.

The research reported in this release was conducted under authority of the Agricultural Marketing Act of 1946 (RMA, Title II). The former Bureau of Agricultural Economics assumed major responsibility for the study, with cooperation and advice from other bureaus in the Department, other government agencies, the National Cotton Council of America, the Association of Electric Wire Manufacturers, the National Underwriters, and other industry representatives. The Munitions Board of the Department of Defense contributed technical advice and funds to cover collection of special information for its use.

The data on which this report is based were collected by Dun & Bradstreet, Inc., of New York City, under contract with the U. S. Department of Agriculture.

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FIBERS AND OTHER MATERIALS USED IN INSULATING ELECTRIC WIRE AND CABLE

Preliminary Summary Report

During the late summer and fall of 1953 the Department of Agriculture undertook a survey of the manufacturers of insulated electric wire and cable to learn the patterns of use and preference for different fibers used as insulating materials. A full report, including detailed information concerning the major materials used for insulating purposes, will be issued later. Because of immediate interest in the volume figures, part of the information is being made available herein in preliminary form.

The data were collected by means of personal interviews with executives of a representative sample of insulated wire manufacturing companies. Two types of questionnaires were used. The schedule to collect volume data was used in interviewing representatives of all companies in the sample. A separate interview questionnaire to determine manufacturers' opinions of trends, purchasing considerations, and other industry practices was used in interviewing executives of 10 of the leading companies in the industry.

The president of each company was first contacted by mail to inform him of the purpose of the study, to elicit his cooperation, and to obtain from him the name of a member of the firm who could speak with authority for the firm.

The items covered in this study were as follows: Communication wire and cable, magnet wire, weatherproof and slow-burning wire and cable, building wire and cable, power wire and cable, appliance wire and cord, and automotive and aircraft wire and cable. All other types of electric wire and cable, such as parkway cables, mineshaft cables, and instrument lead wire were grouped under the heading of "other."

Fibers Used in Electric Wire and Cable Insulating Materials in 1952

The volume figures used here are projections based on a sample of 61 companies. The basis for the projections is as follows:

<u>Sales stratum 1/</u>	<u>Estimated number of companies in universe 2/</u>	<u>Number of companies in sample</u>	<u>Weight for projections</u>
Over \$1,000,000 -----	73	46	1.59
\$500,000 to \$1,000,000 -----	19	7	2.71
\$100,000 to \$499,999 -----	23	4	5.75
Under \$100,000 -----	17	4	4.25
	132	61	2.16

1/ Based on manufacturers' estimates of sales volume of insulated wire.

2/ Based on a number of sources including National Production Authority, Bureau of the Census, and industry listings.

Individual companies are not identified in this report and will not be identified in the final version. Table 1 shows the estimated consumption of different fibers and materials by the several types of insulated wire and cable, as well as overall totals. Table 2 presents detailed figures on consumption of the different classes of the materials as usually ordered by the industry.

For all types of insulated wire and cable included in this survey, plastics accounted for more than one-third and rubber for one-fourth of the consumption of all fibers and materials reported. Paper and cotton came next, with 16 and 11 percent, respectively.

Of the fibers and materials reported for insulation, the greatest quantity went into communication wire and cable, with building wire and cable and power wire and cable next in volume. Appliance wire and cord, weatherproof and slow-burning wire and cable, automotive and aircraft wire and cable, and magnet wire followed in that order. All other types of insulated wire and cable accounted for less than 1 percent of the total pounds of insulating material used by this industry.

<u>Types of insulated wire and cable</u>	<u>Percentage of insulating material used</u>
Communication -----	36
Building -----	25
Power -----	21
Appliance -----	10
Weatherproof and slow burning -----	4
Automotive and aircraft -----	2
Magnet -----	1
Other -----	1
Total -----	100

For communication wire and cable, plastics were used in greatest volume, accounting for almost one-half of the total insulation material used. Paper ranked next, with less than one-fourth, and rubber followed with less than one-fifth. Of the 72 million pounds of plastic material used by this division of the industry, two types--polyethylene of the plastics and vinyl resin--were used in about equal quantities and together accounted for 94 percent. Of the  $35\frac{1}{2}$  million pounds of paper used, almost 60 percent was in paper pulp, and 40 percent in untreated paper. Of the 28 million pounds of rubber used, almost 90 percent was synthetic. The rest was natural rubber.

Cotton, all of it in the form of yarn, was the material most used for insulation of magnet wire,<sup>1/</sup> accounting for somewhat less than half of the total. Fibrous glass and paper were next in importance. The fibrous glass used for this purpose was in the form of filaments, chopped strands, rovings, and yarn. Almost two-thirds of the paper was in treated form and the rest untreated.

<sup>1/</sup> Only those companies which used some fiber in insulation were included in the sample. Companies that insulate only with plastics or with a liquid such as enamel, varnish or lacquer were not included.

In weatherproof and slow-burning wire and cable, cotton was again the leading fiber, followed by plastics and paper. The cotton used was almost all in the form of yarn. Of the 3 3/4 million pounds of plastics used, almost three-fourths was polyethylene; the remainder was vinyl resin. All the paper used was untreated.

For building wire and cable, the three most important insulating materials were plastics, rubber, and paper, in that order. Plastics accounted for a little more than two-fifths, rubber for more than one-fifth, and paper less than a fifth of all materials used. The plastic was almost entirely vinyl resin, and the rubber was almost all synthetic. Slightly more than half of the paper was treated.

Materials used for insulated power wire and cable were somewhat more evenly distributed among the various fibers. Rubber accounted for a little over a third of the total, plastics one-fifth, and paper and cotton over a tenth each. Almost 90 percent of the rubber used was synthetic; vinyl resin was the most important plastic.

For appliance wire and cord, almost half the insulating material used was rubber. Almost a third was plastic. More than 85 percent of the rubber was synthetic, and vinyl resin was by far the most important plastic.

Plastics accounted for over half the insulating materials used by the manufacturers of automotive and aircraft wire and cable. Cotton and rubber, which were used in about equal volume, accounted for more than 40 percent of the total. Here too vinyl resin was the plastic most used. Almost two-thirds of the cotton consumed by this branch of the industry was in the form of yarn and more than one-fifth was cotton braid. Of the rubber used, three-fourths was synthetic and one-fourth natural.

Of the 3 million pounds of material used as insulation for other types of electric wire and cable, plastics and cotton were the most important. Although all of the major types of plastics were used, vinyl resin accounted for almost three-fourths of the total. Only two types of cotton were used--rubber-filled cotton tape and cotton yarn. The tape constituted about two-thirds of the total weight of cotton consumed in these end products.

Table 1.—Estimated quantity and percentage of selected insulating materials used for electric wire and cable in 1952

Material	Types of insulated wire and cable										Total							
	Communication wire and cable		Magnet wire 1/		Weatherproof and slow-burning wire and cable		Building wire and cable		Power wire and cable		Automotive and aircraft wire and cable		All other types	Percent	1,000 lb.	Percent		
	1,000 lb.	Percent	1,000 lb.	Percent	1,000 lb.	Percent	1,000 lb.	Percent	1,000 lb.	Percent	1,000 lb.	Percent	1,000 lb.	Percent	1,000 lb.	Percent		
Acetate -----	2,602.5	2	51.1	2	--	--	--	--	17.4	2/	4.7	2/	31.3	1	2,754.0	1		
Asbestos -----	731.6	1	7.0	2/	--	--	--	--	6,907.4	8	2,985.9	7	--	110.6	4	10,742.5	3	
Cotton -----	9,651.0	6	1,119.5	43	7,901.0	46	10,029.4	9	10,783.2	12	2,494.4	6	2,062.9	22	926.9	29	45,268.3	11
Fibrous glass -----	602.5	2/	913.3	28	117.4	1	7,483.2	7	628.3	1	188.2	2/	182.8	2	7.0	2/	10,182.7	2
Jute -----	4,448.9	3	--	--	58.7	2/	963.7	1	7,702.5	8	2,550.3	6	7.0	2/	31.2	1	15,762.3	4
Linen cord -----	11.6	2/	--	--	--	--	--	--	--	--	5.2	2/	3.2	2/	--	--	13.0	2/
Paper -----	35,470.6	23	751.4	23	3,524.9	21	18,333.7	17	11,783.9	13	393.1	1	168.2	2	.4	2/	70,446.2	16
Plastics -----	72,341.2	47	123.8	4	3,758.5	22	13,327.9	41	19,682.3	21	13,751.0	32	4,864.9	53	1,645.9	52	159,495.5	37
Rayon yarn -----	498.3	2/	--	--	--	--	165.2	2/	32.3	2/	539.8	1	64.0	1	44.9	2	1,344.5	2/
Orlon yarn -----	--	--	1.1	2/	--	--	--	--	--	--	--	--	--	--	--	--	1.1	2/
Silk yarn -----	2.4	2/	9.1	2/	--	--	--	--	--	--	--	--	--	5.2	2/	16.7	2/	
Rubber -----	28,196.4	18	--	--	1,634.0	10	23,949.9	22	33,475.0	36	19,443.4	46	1,850.9	20	358.8	11	108,878.4	25
Sisal -----	--	--	--	--	--	--	2,738.8	3	1,270.7	1	210.7	1	--	--	--	--	4,220.2	1
Total -----	154,550.0	100	3,306.3	100	17,044.5	100	106,991.8	100	92,283.0	100	142,579.0	100	9,208.6	100	3,162.2	100	429,095.4	100

1/ Manufacturers of magnet wire that insulate only with plastics or with liquids such as enamel, varnish, or lacquer were not included in the sample.

2/ Less than 1 percent.

Table 2.--Percentage of selected insulating materials used for electric wire and cable, by class of material, 1952

Class of material	Types of insulated wire and cable								
	Communication wire and cable	Magnet wire <sup>1/</sup>	Weather- proof and slow- burning wire and cable	Building wire and cable	Power wire and cable	Appliance wire and cord	Automotive and air- craft wire and cable	All other types	Total
ACETATE:	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Yarn -----	100	100	--	--	--	78	4	26	98
Untreated tape -----	2/	--	--	--	88	22	--	74	2
Varnished tape <sup>3/</sup> -----	2/	--	--	--	12	--	96	--	2/
Total -----	100	100	--	--	100	100	100	100	100
Thousands of pounds -----	2,602.5	51.1	--	--	17.4	47.0	4.7	31.3	2,754.0
ASBESTOS:	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Filaments, rovings, yarn -----	99	83	--	--	79	99	--	100	86
Paper tape -----	--	--	--	--	18	1	--	--	12
Tape -----	1	17	--	--	3	--	--	--	2
Sleeving and tubing -----	--	--	--	--	--	--	--	--	--
Total -----	100	100	--	--	100	100	100	100	100
Thousands of pounds -----	731.6	7.0	--	--	6,907.4	2,985.9	--	110.6	10,742.5
COTTON:	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Raw -----	--	--	--	2/	2/	--	--	--	2/
Braid -----	2/	--	--	--	--	15	22	--	2
Yarn -----	95	100	100	92	47	84	63	35	81
Cord or twine -----	2/	--	2/	--	6	1	--	--	1
Untreated tape -----	4	--	2/	4	14	--	11	--	6
Varnished tape <sup>3/</sup> -----	2/	--	--	1	24	2/	2/	--	6
Plastic tape <sup>3/</sup> -----	2/	--	--	--	--	--	--	--	2/
Processed cotton -----	1	--	--	--	--	--	--	--	2/
Neoprene tape <sup>3/</sup> -----	--	--	--	--	1	--	--	--	2/
Rubber filled cotton tape <sup>3/</sup> -----	2/	--	--	3	8	2/	2/	65	2/
Vinyl tape <sup>3/</sup> -----	--	--	--	--	2/	--	4	--	2/
Total -----	100	100	100	100	100	100	100	100	100
Thousands of pounds -----	9,651.0	1,419.5	7,901.0	10,029.4	10,783.2	2,494.4	2.062.9	926.9	45,268.3
FIBROUS GLASS:	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Filaments, chopped strands, rovings, yarn -----	90	100	100	97	78	100	99	100	96
Untreated tape -----	3	--	--	--	5	--	2/	--	1
Varnished tape <sup>3/</sup> -----	7	--	--	--	11	--	1	--	1
Bonded cord, plastic glass -----	--	--	--	--	6	--	--	--	2/
Paper, fibrous glass <sup>3/</sup> -----	--	--	--	3	--	--	--	--	2
Total -----	100	100	100	100	100	100	100	100	100
Thousands of pounds -----	602.5	943.3	147.4	7,483.2	628.3	188.2	182.8	7.0	10,182.7
PAPER:	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Untreated -----	40	64	100	45	88	65	85	100	53
Treated -----	2	36	--	55	10	35	15	--	18
Paper pulp -----	58	--	--	--	--	--	--	--	29
Cable paper filler -----	--	--	--	--	2	--	--	--	2/
Total -----	100	100	100	100	100	100	100	100	100
Thousands of pounds -----	35,470.6	751.4	3,514.9	18,333.7	11,783.9	393.1	168.2	.4	70,416.2
PLASTICS:	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Kel-F, Teflon -----	2/	--	--	--	2	--	1	2	1
Nylon:	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Yarn -----	2/	98	--	--	2/	2/	2/	2/	2/
For extrusion -----	6	2	--	--	2/	2/	5	3	3
Polyethylene -----	47	--	72	2/	15	3	12	13	25
Silastic -----	2/	--	--	--	2/	--	2	9	2/
Vinyl resin -----	47	--	28	100	83	97	80	73	71
Total -----	100	100	100	100	100	100	100	100	100
Thousands of pounds -----	72,341.2	123.8	3,758.5	13,327.9	19,682.3	13,751.0	4,864.9	1,645.9	159,495.5
RUBBER:	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Natural -----	12	--	--	2	11	12	25	29	9
Synthetic -----	88	--	100	98	89	86	75	71	90
Reclaimed -----	2/	--	2/	2/	2/	2	--	--	1
Total -----	100	--	100	100	100	100	100	100	100
Thousands of pounds -----	28,196.4	--	1,634.0	23,949.9	33,475.0	19,413.4	1,850.9	358.9	108,878.4

<sup>1/</sup> Manufacturers of magnet wire that insulate only with plastics or with liquids such as enamel, varnish, or lacquer were not included in the sample.

<sup>2/</sup> Less than 1 percent.

<sup>3/</sup> Adjusted to eliminate weight of material other than fiber or fabric involved.





